ANTENNAS AND PROPAGATION

Modeling, Simulation & Measurements

Edited by

MD. RAFIQUL ISLAM B.Sc.,M.Sc.,Ph.D.,MIEEE
International Islamic University Malaysia

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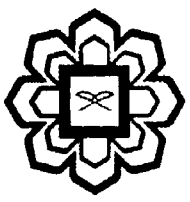

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Chapter 14

Direction of Arrival Algorithms For Array Antenna Design

Ibrahim A. Haji[1], Md. Rafiqul Islam[1], A.H. M Zahirul Alam[1], Othman O. Khalifa[1] and Khaizuran Abdullah[1]

14.1 Introduction

One important issue in the array design for smart antenna application is the direction of arrival estimation methods. According to [1-4], in a propagation channel, even for one source there are many possible propagation paths and angles of. For multiple transmitters operating simultaneously, each source can create many multipath components at the receiver. This necessitates that a receiver array has the ability to estimate the angles of arrival in order to identify which emitters are available and what are their possible angular locations. This information helps eliminate or combine signals for greater fidelity, null interfering noise signals, or both. This information supplied by the DOA algorithm is then processed by means of beamforming algorithm to ideally steer the maximum radiation of the antenna pattern toward the direction of the desired user and place nulls in the pattern toward the interferer [2-4, 7]. In this research work, the analysis of the DOA estimation methods considered include Bartlett method, minimum-variance distortionless response estimator, linear prediction and the MUSIC estimation method.

14.2 Operation of the Direction of Arrival Estimation Methods

The DOA methods estimate the angle of arrival by computing the spatial spectrum or pseudospectrum of the signal [3]. That is, the mean power received by an array as a function of the angle Θ, and then determining the local maxima of this computed spatial spectrum. Figure 14.1 shows D signals arriving from D directions. They are received by an array of M elements with M potential weights. Each received signal is sensed by the array by reading the information of its power level. This information is fed to the beamforming algorithm for creating complex weights used to steer narrow beams towards the desired user.

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